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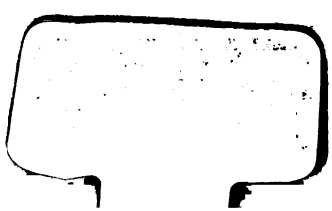

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THOUGHTS

ON THE

FARTHER IMPROVEMENT

OF

Aeroſtation.

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THOUGHTS

ON THE

FARTHER IMPROVEMENT

OF

AEROSTATION,

OR THE

ART OF TRAVELLING

IN THE

ATMOSPHERE:

WITH A

DESCRIPTION

OF A

MACHINE,

NOW CONSTRUCTING,

On different Principles from thoſe hitherto adopted.

By the INVENTOR of the MACHINE.

Nil tam difficile eſt, quin quærendo inveſtigari poſſiet.

TER. Heaut.

LONDON:

Printed for the AUTHOR;

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THOUGHTS, &c.

HAVING been for ſome time paſt employed in conſtructing a machine on new principles, for the farther improvement of the art of aeroſtation, lately diſcovered, I was about to publiſh ſome general account of this invention, together with the particulars of my own improvements; but, in Mr. Cavallo's Hiſtory of Aeroſtation, the ſubject is ſo fully and ably handled, that, for the preſent, I ſhall confine myſelf to ſuch obſervations only as relate to the conſtruction and uſe of the above machine; whereby it is propoſed that a

perſon, raiſed into the atmoſphere by means of inflammable air, ſhall be able to convey himſelf in different directions without being wholly impelled by the current of air.

This moſt important part of the ſubject is but lightly touched upon by Mr. Cavallo; and, ſince he propoſes it as matter of farther inveſtigation, what is here offered cannot, I preſume, be conſidered an intruſion upon a work which appears to me to have conſiderable merit; and, except in quoting a few paſſages by way of introduction, I ſhall confine myſelf to this ſingle ſubject, — the government of theſe machines in the atmoſphere, which may be conſidered as only one branch, though it muſt be confeſſed a material one, in this new-diſcovered field of ſcience.

It is, I believe, a principle admitted in all parts of natural philoſophy, that, in reaſoning on ſubjects with which we are little acquainted, next to actual

experience,

experience, is the analogy the matters of enquiry bear to thoſe that are familiar to us. And, as this ſubject of aeroſtation is experimentally almoſt unknown, and the information obtained from thoſe who have travelled in the air at preſent but very ſlender, I think it beſt to proceed on the other ground, and, for that purpoſe, premiſe the following axioms:

I. That the means uſed to navigate on water (an element approaching neareſt to the air) will ſerve to govern an inquiry as to the mode of conducting ourſelves through the atmoſphere, with this difference, that the uſe of ſails muſt be entirely rejected, as will appear on farther conſideration of the ſubject.

II. That the air, in calm weather, bears great ſimilitude to a body of water where there are neither waves nor currents; and, in windy weather, reſembles currents of water moving with different degrees of velocity.

This being premiſed, I ſhall ſhortly take notice of the different methods hitherto uſed, or propoſed, for guiding aeroſtatic machines in a horizontal direction, without touching on the means for raiſing or depreſſing them, and then proceed to ſtate the plan I have adopted, which, if it is found to anſwer the firſt purpoſe, will, I doubt not, be ſufficient for the others.

Mr. Cavallo ſays it has been propoſed to annex ſails to theſe machines; but, at the ſame time, he very juſtly explodes this idea. "Since," ſays he, "the aeroſtatic machines, being at "reſt with reſpect to the air that ſur- "rounds them, feel no wind, and con- "ſequently the ſails cannot poſſibly act." This is followed by a very judicious compariſon of veſſels at ſea, and I will beg leave to ſubjoin an inſtance reſpecting the air, — a boy's kite, which is elevated by the impulſe of the wind againſt it; but, if the ſtring is broken or let go,

the

the kite immediately falls in an oblique direction, driven onwards in the air, at the ſame time that it is attracted to the earth by the power of gravitation.

" It has been propoſed", ſays Mr. Cavallo, " to puſh againſt the air, on one " ſide of the machine, by means of the " ſtream iſſuing out of an Æolipile or " fire-engine, or by rockets faſtened to " the machine, and fired ſo that their " ſtream might be oppoſite to the courſe " intended." But, beſides the objections he makes to theſe modes, I think no advantage can be expected from them, as the lateral preſſure of the air muſt be very unequal, and the materials ſoon exhauſted. It is beſt, therefore, to abandon theſe ideas in ſearch of a more permanent and ſimple plan of operation.

Mr. Cavallo then mentions oars, or wings, as the only means that have been attempted with any degree of ſucceſs; and which he thinks capable of conſiderable improvement;

improvement; in all which I perfectly agree with him, as well as in his remarks on their conſtruction and uſe.

A helm is, by Mr. Cavallo, ſhewn to be uſeleſs; and it certainly muſt continue to be ſo, until a method is found to afford the machine a progreſſive motion independent of the impulſe of the air, being what is termed by ſeamen head-way, and which alone can give effect to the operation of the helm.

Let us now conſider the form and ſtructure of the different contrivances that have been uſed for conveying perſons through the air, and alſo for the government of their machines.

The form of the capſula, or caſe, to contain the air, whether rarified or inflammable, by the help of which the traveller was ſupported, has been either ſpherical, or ſomewhat approaching to a globular figure, ſuch as a ſegment of a ſphere or a ſpheroid. To this they have ſuſpended

ſuſpended a veſſel, or car, generally in the form of a boat, furniſhed with oars or wings fixed to the ſides, ſo contrived as to give way to the air in one direction, and to take hold of it in the contrary direction; but I do not find that any have been made flat, to turn edge-ways when moved backwards, except thoſe invented by Count Zambeccari.

From the form of theſe balloons and their apparatus, it ſeems plain that even a very light breeze muſt effectually defeat the traveller of any power to govern his machine contrary to the courſe of the wind, and that in a perfect calm he would be able to make but a very ſlow and uncertain progreſs.

For, firſt, the globular figure of the balloon, though beſt calculated to contain a large quantity of inflammable air, has this inconvenience, that, in all directions, it preſents to the wind a ſurface equal to a circular plane of the diameter

of

of the ſphere. This plane, by reaſon of the great ſize the globe muſt neceſſarily be of, ſo far exceeds the ſuperficial contents of the oars, that the impulſe of the wind on the larger ſuperficies muſt infallibly counteract all the efforts of the traveller to give it a contrary motion. It may, indeed, be allowed that, in perfect calm weather, the aeronaut might, by the uſe of oars, impel his machine forward, provided they were proportionably adapted in point of ſize; but, even in that caſe, I am of opinion the progreſs made would be very inconſiderable.

To illuſtrate this, ſuppoſe a round veſſel, of ſufficient capacity to contain a man, placed in a ſtream of water, and let the man be furniſhed with oars properly adapted to the ſides; though he may be able to conduct it from one ſide to the other in a ſide-long direction, yet he will find it impoſſible to row the veſſel againſt the ſtream, and, in ſtill water, he could only row it forward very ſlowly.

ly. If any one doubts of theſe poſitions, let him obſerve with what labour and difficulty a waterman rows his boat in the Thames againſt the tide, though it is conſtructed in the moſt advantageous manner to make its way through the fluid. It may be ſaid, that the air is nearly a thouſand times lighter than water; but it muſt be remembered, that the oars, or wings, have only the ſame light body, the air, to exert themſelves againſt, with this farther difficulty, that the whole body of the aerial machine is immerſed in the fluid to be reſiſted, whereas only a ſmall part of the boat is oppoſed to the water.

In the next place, the boat, or car, containing the aerial traveller, has been ſuſpended by ropes at ſome diſtance from the balloon; the conſequence of which muſt be, that, however great his exertions with oars or wings, they can produce little or no effect on the ſuperior body; but, if ſtrongly exerted, I ſhould

imagine would produce a kind of ſwinging of the car itſelf, rather than impart any motion to the globe.

Let us now compare this by analogy to the water, and conſider it the ſame as a man, placed in a ſmall boat, towing a large veſſel after him. Every waterman will tell us how laborious a taſk this is, even in ſtill water; and perſons from the ſhore may obſerve that the effect produced is inconſiderable: and, againſt a ſtream, or current, it would be vain by that means to attempt any progreſs at all: whence I think we may infer, that the aerial traveller can have little proſpect of moving or towing his globe by any operation performed in a car ſuſpended as hitherto has been done, and that the oars, or wings, are very inadequate to the purpoſe of overcoming theſe difficulties; eſpecially ſuch of them as have been made to expand and contract, as Mr. Blanchard's, or to open and ſhut, as Mr. Lunardi's; and which are attended with

this

this inconvenience, that, when placed in a poſition to act, by the time they are able fully to exert their power on the air, they have deſcribed a great portion of the circle on their axis, and a principal part of the ſtroke is loſt. The beſt way, therefore, of conſtructing them, is to make them flat, like Count Zambeccari's; but his, though made upon a plane, by ſilk fixed on tin pipes, were not, in my opinion, properly formed, the ſilk being looſe and flaccid between the pipes, whereas it ſhould have been ſtrained tight, to act upon the air the inſtant it was turned and the ſtroke intended to be taken. But, as the Count did not carry theſe with him on his late aſcenſion, the probable effect of them muſt reſt in conjecture only.

From what is here ſaid, it muſt be evident, that either of the obſtacles above ſtated is ſufficient to prevent the aeronaut's making any conſiderable progreſs in the atmoſphere, and the con-

ſequence of both united muſt be perpetual diſappointment and difficulty.

Indeed theſe objections formerly appeared to me inſurmountable, and I treated the idea of governing theſe machines as altogether chimerical; but, on more fully conſidering the ſubject, I concluded that it was not impracticable to deviſe means of removing the difficulties, at leaſt in a great degree.

To this end, we muſt abandon all the methods hitherto uſed, and, availing ourſelves only of the application of inflammable air, proceed on new and almoſt totally different principles, in the conſtruction of ſuch a machine as can promiſe any ſucceſs.

Firſt, The globular figure of the balloon muſt be exchanged for one of an oblong form, conſtructed in ſuch a manner that it may be ſharpened at one end, in order to divide the reſiſting fluid, and open itſelf a paſſage in like manner as a boat in the water. Secondly, The car for the traveller being

being laid aſide, we muſt find a place for him ſomewhere within the machine, of which his ſeat may conſtitute a part. Thirdly, He muſt be furniſhed with inſtruments of ſufficient capacity, in their ſuperficies, to take good hold of the air, and of competent ſtrength to bear the whole exertion of the traveller's muſcular power, aſſiſted by whatever mechanical advantages it may be thought neceſſary to give him. What theſe mechanical advantages may be, will be conſidered when we come to treat of the ſtructure and uſe of oars applied to this purpoſe.

The idea of a * boat will now naturally ſuggeſt itſelf. But here, again, it is to be obſerved, that a boat is ſupported by the water from beneath, but an aeroſtatic machine is upheld by the contained air; ſo that, if we make a machine in this form, it muſt reſemble a boat turned upſide down. It is

* The boat, light ſkimming, ſtretch'd its oary wings.
THOMSON.

is probable, that the firſt conſtructor of a veſſel might borrow his idea from a water-fowl, and to this day the beſt ſailing-ſloops are made nearly of that figure; nay, it is a common phraſe, among ſeamen, commending a well-trimmed ſhip, to ſay ſhe ſits like a duck upon the water. And, in the preſent caſe, having in view to ſeek our paſſage in an element ſo newly explored by man, let us reſort to the unerring book of nature,† thence to borrow our improvements; in doing which, without adverting to the birds, who are formed in a manner to ſuſtain as well as direct themſelves in the air, we muſt, being already provided with the means of elevation and ſupport, conſider the ſtructure

† —— and meditate the book
Of nature, ever open.

THOMSON.

If men would be content to graft upon nature, and aſſiſt her operations, what mighty effects might we expect!

SPECTATOR, No. 404.

ſtructure of thoſe animals who are enabled to ſteer their courſe in the element which ſuſtains them, and which approaches nearest to that in which we are endeavouring to give ourſelves a progreſſive motion. — And, on conſidering the form and ſtructure of a * FISH, we ſhall find it admirably calculated to obviate all the difficulties above ſtated. Firſt, Although we make the figure large, in order to contain a ſufficient quantity of inflammable air, yet the ſharp head will open to it a paſſage through the atmoſphere, while the tail ſteers its courſe. Secondly, In the lower part of the body may be formed a vacancy, to place the traveller on a convenient ſeat, without deſtroying the general figure. Thirdly, Here again, by analogy, nature points out to us, in the fins, not only the inſtruments to be uſed, but the moſt advantageous poſition for them;

* The fiſh that roves through trackleſs paths of ſea.

HERVEY.

them; ſufficient capacity and ſtrength, both to take good hold on the aerial fluid, and alſo to bear the whole exertion of the traveller's muſcular ſtrength, being attended to.

Upon theſe principles I have proceeded in the conſtruction of a machine; in doing which, regard has been had to make the outer figure of ſuch materials as will be of ſufficient ſtrength to preſerve its form, and at the ſame time not ſo heavy as to prevent its elevation by the air it is capable of containing. For, ſhould the form be deſtroyed, the principal end we aim at will be fruſtrated; and, if the machine is too weighty, we ſhall not be able to make any experiment.

The ſeat for the traveller is endeavoured to be made the center of gravity, in order that the machine, being ſupported equally at either end, may be always in a horizontal poſition; and this ſeat is firmly attached to, and forms a part of, the machine, that the impulſe of whatever

ever force is uſed there may actuate the whole body.

The manner of applying this force is by rowing with what (to continue the alluſion) may be termed fins. And, as theſe are principally relied on in the deſign of obtaining a paſſage through the air, it is proper, on that ſubject, to be explicit as to their conſtruction and uſe. I have already obſerved, that the wings uſed by Mr. Blanchard promiſe but little ſucceſs, on account of their flexibility; for, as the air is of a light and compreſſible nature, it will be difficult to take ſufficient hold of it, ſo as to gain the neceſſary repulſion, unleſs it is contrived that the wings exert their whole power the inſtant they are applied. The fins, therefore, which I have made, being of ſilk ſtrained over a ſolid frame, will not at all yield to the air, but, reſiſting it from the firſt moment they are applied, will impart the full effect of each ſtroke. Being thus conſtructed,

they muſt be uſed by turning the edge to the wind in recovering the ſtroke, or what the watermen call feathering, to which their form will aſſiſt, being ſo contrived, that the action of the wind alone will incline them to that poſition: however, the perſon who uſes them ought to be well ſkilled in the management of an oar.* In a word, theſe fins are made to bear as near a reſemblance as may be to the oars or ſculls uſed on the water, which are conceived to be the beſt adapted to aſſiſt the traveller's muſcular ſtrength in rowing. It has been propoſed by ſome to apply mechanical powers; but this idea ſeems to be erroneous, for it is a known maxim

* The late learned Dr. Johnſon, whoſe general knowledge was ſo great, that, in the inveſtigation of new theories, both in philoſophy and mechanics, it ſeemed almoſt intuitive, gave it as his opinion, a ſhort time before his death, without knowing any thing of the machine now propoſed, that, if ever any ſucceſs was obtained in guiding aeroſtatic machines, it muſt be by rowing, and that this muſt be performed by a perſon well ſkilled in that exerciſe.

maxim in mechanics, that what is gained in power is loft in time: the friction of the moving parts is another objection, and, in the preſent experiment, the weight of materials.

The application of muſcular power, in the manner of rowing, is found, by the uſe and experience of ages, to afford the beſt opportunity of exerting our greateſt ſtrength with the leaſt fatigue; for the friction on the fulcrum, or point, where the oar reſts, is very ſmall, being in general one round edge againſt another, and which friction is farther leſſened by the part in contact being oiled or greaſed. It is this fulcrum which bears the whole weight of the oar nearly on a balance, ſo that the only labour of the rower is to give the motion.

In uſing the fins, it is apprehended, that, to take ſufficient hold on the air, the ſtroke muſt be performed with as quick a motion as may be; by which is

not meant the performing many ſtrokes in a ſhort time, but that each ſhould be taken with a quick motion; and, if this, upon trial, is found to impart a tolerable degree of velocity to the machine, ſome interval of reſt may be allowed between the ſtrokes.

The next conſideration is the tail; — and, as this is known to be the ſeat of the greateſt power of a fiſh, it will be expected that we derive aſſiſtance from imitating it, and ſo we moſt probably ſhall in ſome degree; but we muſt expect, in this as in all caſes, to find the works of art very defective in compariſon with the unerring operations of nature. One of the purpoſes, to which the inhabitants of the water apply their tails, is to give their bodies a progreſſive motion; and this they can perform with aſtoniſhing rapidity. The objections, however, to our applying the tail to ſuch advantage, are, I fear, ſo material and inſur-

mountable,

mountable, that we muſt content ourſelves with uſing it as a rudder only, which purpoſe it will certainly anſwer, provided we can with the fins give headway to the machine.

Let us now reſume the ſubject of the general figure, in order to advert to ſome of Mr. Cavallo's remarks, which deſerve to be well conſidered. He admits an oblong figure to be the moſt advantageous for the purpoſe of being guided in a calm, or in a courſe different from the direction of the wind; but he obſerves, very juſtly, that, in the conſtruction of aeroſtatic machines, the moſt advantageous form, in point of capacity, is the ſpherical; and that, the more we depart from this form, the greater quantity of materials muſt be uſed to contain the ſame quantity of air. To compenſate for this, it is apprehended that the following advantages will be derived from the machine now under conſideration: the weight of the materials, which have been uſed in conſtructing

conſtructing a car or gondola for the traveller, will be in a great meaſure avoided by ſubſtituting a ſeat, in the machine itſelf, conſiderably lighter than any hitherto uſed; the ſubſtantial part, alſo, giving it a form and ſome degree of ſolidity, will render unneceſſary the net, zone, &c. with which balloons have been incumbered; and, laſtly, it is preſumed that the traveller will not ſtand in need of much more ballaſt than is requiſite to compenſate for the loſs of inflammable air eſcaping through the capſula, or caſe, as it is expected to be found, upon experiment, that the fins are equal to anſwer the purpoſe of elevation or depreſſion.

Here I beg leave to conſider an objection of Mr. Cavallo's to theſe oblong figures. He ſays, "that, to keep "the oblong machine with the ſmalleſt "part forward in the atmoſphere, is not "eaſily accomplished; and that, if it "were to turn ſideways, then that ſame "ſhape

" ſhape, which, in a proper ſituation, " would be of ſome advantage, will, in " this caſe, be of very great diſadvan- " tage." As to the firſt part of this objection, it probably will depend, in a great meaſure, on the ſkill of the traveller, to keep his machine in a proper direction by the help of the fins and tail, to which perhaps the figure itſelf will contribute; for, the center of gravity being placed ſo that the tail is projected much farther from it than the head, the finny part of the tail (eſpecially if the machine has any motion of its own through the air) will probably turn the head to windward. The other part of Mr. Cavallo's objection, is that the machine may accidentally turn ſideway, and, if this could be the caſe, it would be dangerous in proportion to the rapidity of the motion; for, if that were violent, and the ſide ſuddenly turned to windward, the conſequence might perhaps be miſchievous. But it is conjectured, for the reaſons

ſons before given; that, if the traveller is but tolerably expert, the danger of its happening will not be great, or, at moſt, not greater than the riſks conſtantly run by thoſe who venture upon the water.

There is another difficulty attending the uſe of balloons. The travellers have not yet been able to make any ſtop in their courſe without putting an end to the voyage, or diſcharging one or more of their number, or a quantity of ballaſt, to enable them to continue it. To prevent which inconveniences, why may not an anchor or grappling be applied? Mr. Lunardi, I find, had, ſuch an inſtrument when he aſcended; but it does not appear, by his Narrative, that he made any experiment with it. Indeed, if he had attempted to uſe it, the conſequence is obvious: the wind, driving his balloon one way, and his rope counteracting it, muſt have overſet the gallery and car; and this, I conceive, will

will ever be the conſequence of endeavouring to caſt anchor with a balloon.—The caſe is different with a ſhip at anchor in the ſea or in a river: becauſe the hawſe-hole, through which the cable paſſes, is very near the part of the veſſel oppoſed to the current. But, to make the inſtances parallel, let us ſuppoſe a veſſel anchored by a cable fixed to the main-maſt; and then, if it were poſſible for the anchor and cable to ſuſtain the ſhock, I believe no one can doubt but the veſſel would be overſet. This difficulty is provided againſt, and the danger avoided, in the preſent machine; for, in whatever direction it is moving, the head will be immediately turned to the wind, upon letting fall the grappling on any convenient building or tree, if the traveller wiſhes to make a ſtop without alighting, or upon faſtening it to ſome fixed body in the ground if he deſires to alight from his machine at any town or houſe; in which latter caſe,

he can procure aſſiſtance if neceſſary. Only it is conceived care ſhould be taken, in caſting anchor, not to bring up (in the ſea-phraſe) too haſtily, but by degrees, to avoid breaking the cable or damaging the machine; which being thus brought to an anchor, in like manner as a veſſel ſwings round with her head to the tide, it is obvious that it cannot poſſibly overſet; and it is preſumed, that the ſharp figure of the head will break the force of the wind then blowing againſt it, and give it an eaſy paſſage along the ſides. This manner of caſting anchor in the air (if I may be allowed the expreſſion) would be attended with many advantages, eſpecially if an impervious ſubſtance ſhould hereafter be diſcovered whereof to make the capſula, or caſe.

Mr. Cavallo has an obſervation applicable to this ſubject of anchoring: — "that, when an aeroſtatic machine is "kept confined by ropes, eſpecially at a "conſiderable height above the ground,

"the

" the wind, blowing on it, muſt drive it
" in its own horizontal direction; ſo
" that the cords which hold the machine
" muſt make an angle with the horizon,
" which is greater when the wind is
" ſtronger, and contrariwiſe; in conſe-
" quence of which, the machine muſt
" be much fatigued, it being acted on by
" three forces in three different direc-
" tions: namely, its power of aſcenſion,
" the confinement of the ropes, which
" is oppoſite to the firſt, and the action
" of the wind, which is acroſs the other
" two. It is, therefore," ſays he, " in-
" finitely more ſafe to abandon the ma-
" chine entirely to the air, becauſe then
" it ſtands perfectly balanced, and there-
" fore is not at all fatigued."

This concluſion of Mr. Cavallo ſeems to forbid our hopes of making any oppoſition to the wind by balloons as hitherto conſtructed. Indeed it has been matter of wonder, that the materials of them, eſpecially the large ones, ſhould hold to-

gether at all, againſt a wind in the leaſt boiſterous, reſtrained by ropes before their aſcent, or checked afterwards in their progreſs. Upon the whole, as we muſt of neceſſity conſtruct our capſula, to contain the inflammable air, of very thin and light materials, there ſeems no way more likely to prevent this inconvenience than ſome contrivance to protect the capſula from the violence of the wind; which, in the ſtructure of the machine now under conſideration, it is preſumed, will be, in a great meaſure, accompliſhed: the head, terminating in a point, will, as before obſerved, break the force of the current of air, by giving it a ſide-long direction; and, the whole having an outer covering of ſilk, the inner caſe will be defended, both in its paſſage through the air, and alſo in its oppoſition to the wind when reſtrained by a rope.

Thoſe, who have hitherto explored the atmoſphere, generally aſcended to great

great heights, and the line of their courſe ſeems to have been a curve not much unlike that deſcribed by a ſhell thrown from a mortar; and this mode of aſcending to great heights may be of uſe in making philoſophical experiments; but, when we deſire to apply this aeroſtatic art to the purpoſe of uſeful conveyance, (which will perhaps be the caſe, if, as Mr. Cavallo ſeems to think, the inflammable air may hereafter be obtained at an eaſy rate,) a courſe nearly horizontal muſt be acquired, obſerving only a ſufficient degree of elevation above trees or buildings over which we paſs.

It it be aſked, what progreſs is hoped to be obtained by this invention? the anſwer is, that, in calm weather, or if there is very little wind, it is expected that the aeronaut may guide his machine at pleaſure, and moſt probably with conſiderable expedition, the reſiſting medium being very rare, and eaſily giving way to the motion; and that, in a moderate

derate breeze, the motion will be oblique, or in an angle which will be acute in proportion as the wind is more or leſs violent. But we ſhall dwell no longer on a matter of theory, which can only be confirmed by actual experiment.

Before I conclude, I beg to have it underſtood, that, though I have in a manner condemned the form and ſtructure of balloons, and the methods hitherto attempted for the government of them, I would not be thought to caſt any reflection on thoſe who have adopted theſe methods. Upon every new diſcovery there muſt be time for improvement; and it would be preſumption in any one to think his own invention ſo complete that it cannot be improved. In the caſe before us, though it may deſerve cenſure to perſiſt in the application of means that have been repeatedly found ineffectual, yet let us give due praiſe to our neighbours, the French, for their ingenuity as the firſt inventors of the aeroſtatic art, and their

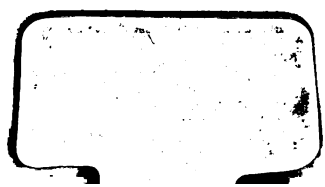
intrepidity

intrepidity in the application of it. And indeed, by how much the more hazardous or ungovernable their balloons have been, ſo much the greater their courage; as it requires much more reſolution to venture on an unknown ocean, in a veſſel without compaſs or rudder, than to follow a courſe explored by others, aſſiſted with ſuch inventions as the art of man has from time to time furniſhed. But, having rendered to the French the tribute juſtly due to them, I have the vanity to hope that my native country will produce conſiderable improvements on their diſcovery; and, if the machine here treated of, ſhould be found to lead to any ſuch, I cannot but indulge a wiſh natural to an Engliſhman, that the name as well as the invention of it may be Engliſh. The French word *ballon*, meaning a *ball*, is properly applied to globular figures, and may well be angliciſed by the word *balloon*. But, the figure being now propoſed to be totally altered, the name can

on

no longer with propriety be uſed; and, in alluſion to the animal which we have been led to imitate, may we not properly call this machine — a FLYING FISH?

Enough has now been ſaid on this ſubject, at leaſt for the preſent. The machine here deſcribed is nearly completed, and, when in ſufficient forwardneſs, will be exhibited for the ſatisfaction of the curious. The author of theſe ſheets begs leave to ſubmit them, and his invention, to the candour of the public. If his machine, upon experiment, ſhall be found in any degree to anſwer his expectation he will then publiſh a particular deſcription of every part of it, together with what information may have been derived from experience. But if, after all, it ſhould be ineffectual to any of the ends propoſed, he hopes it may at leaſt be ſaid of him,

" —— *magnis tamen excidit auſis.*"

THE END.